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Feasibility Study of Non-Potable Reuse Water for Cooling of Future Supercomputer Infrastructure Title:

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Feasibility Study of Non-Potable Reuse Water for Cooling of Future Supercomputer Infrastructure

Savanna Smith August 13th, 2018



<u>Overview</u>



- Background
- Cooling Tower Operation
- Water Sources
- Delivery and Piping
- Water Requirements
- Water Treatment
- Outfall and Discharge
- Contract Description
- Conclusion and Recommendations
- Future Work





Background





Background









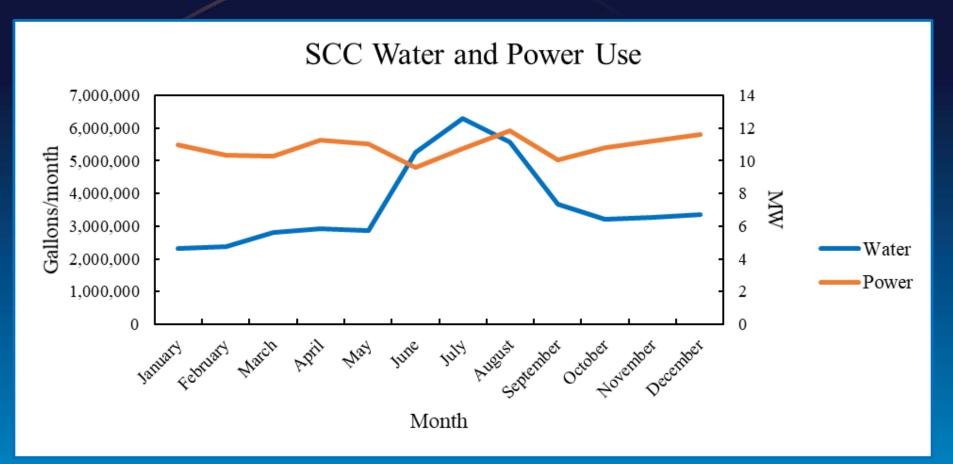
Cooling Tower Operation







Cooling Tower Operation





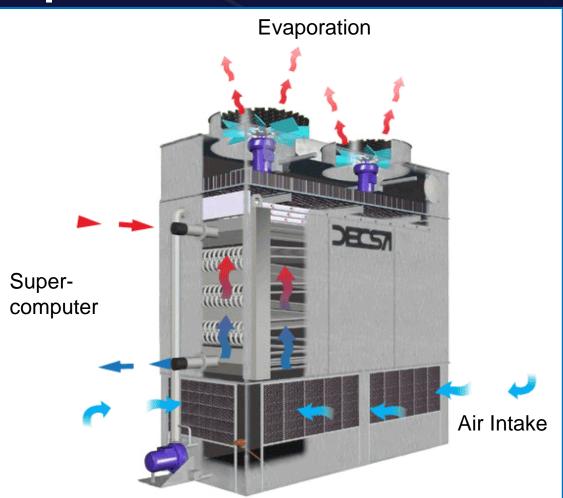








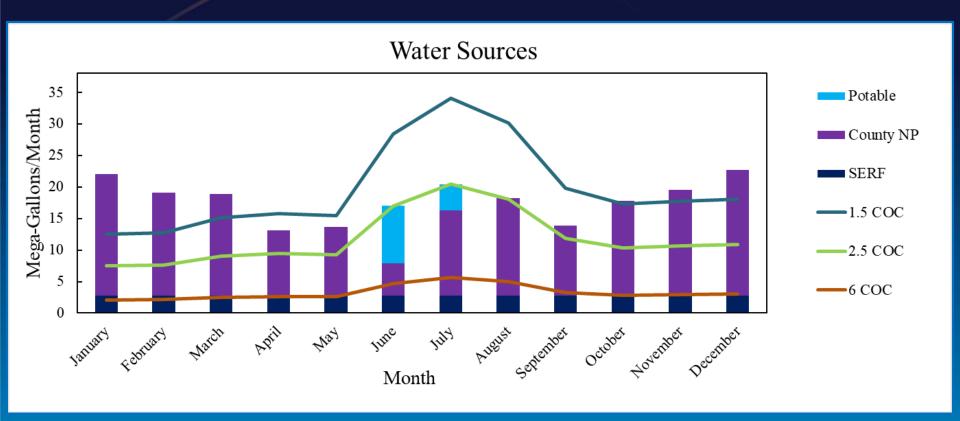
- Blowdown: highly concentrated water removed to reduce concentration of solids
- Makeup: replaces blowdown and evaporated water
- Cycles of concentration: ratio of solids in blowdown to makeup water















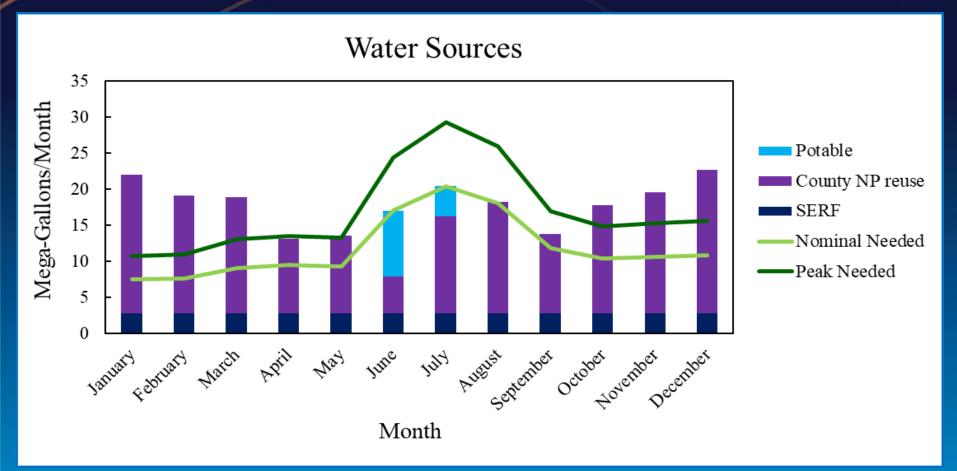
Water Sources









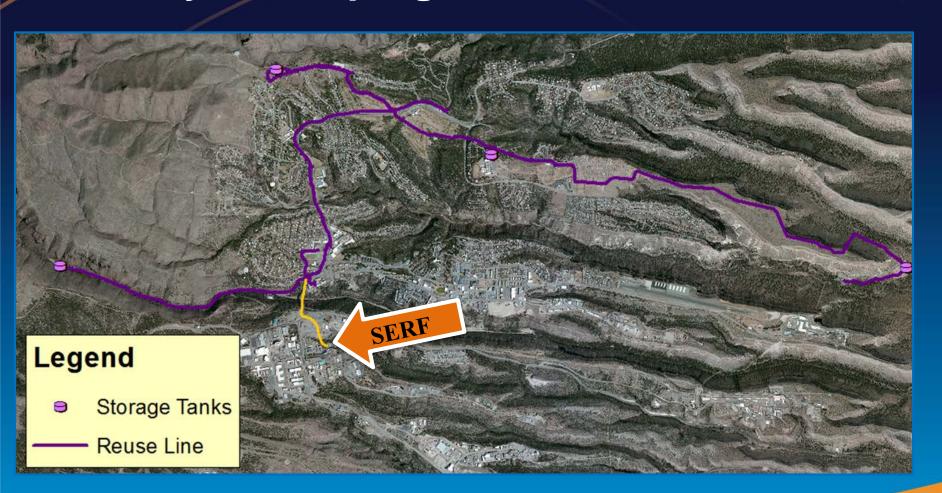


























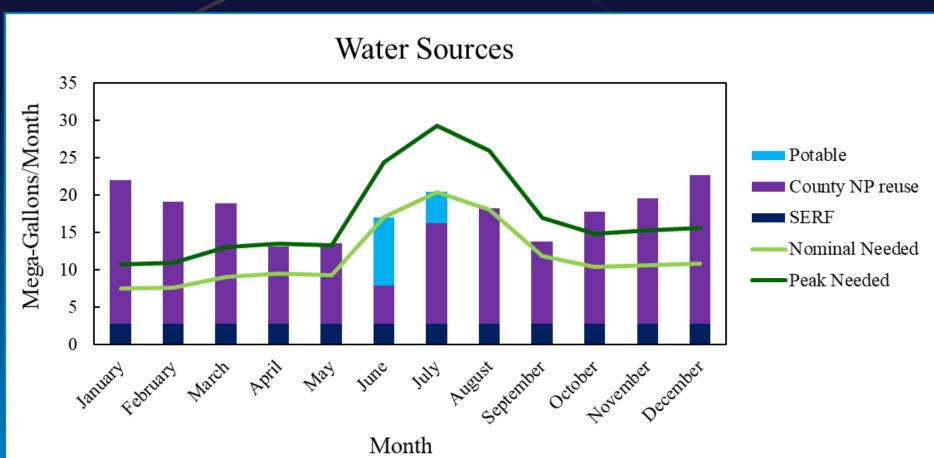
















Water Requirements





Water Requirements



- Cooling towers:
 - Silica
 - Phosphate
- Discharge:
 - Chlorides
 - PCBs
- Need additional treatment of:
 - Phosphate (anti-foaming)
 - PCBs





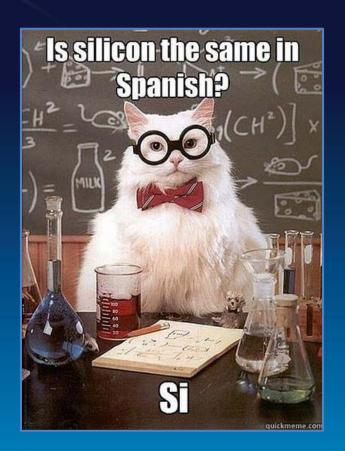






Silica concentrations

- Potable: 70 to 80 ppm
- SERF: 15 ppm
- NP reuse: 72 ppm









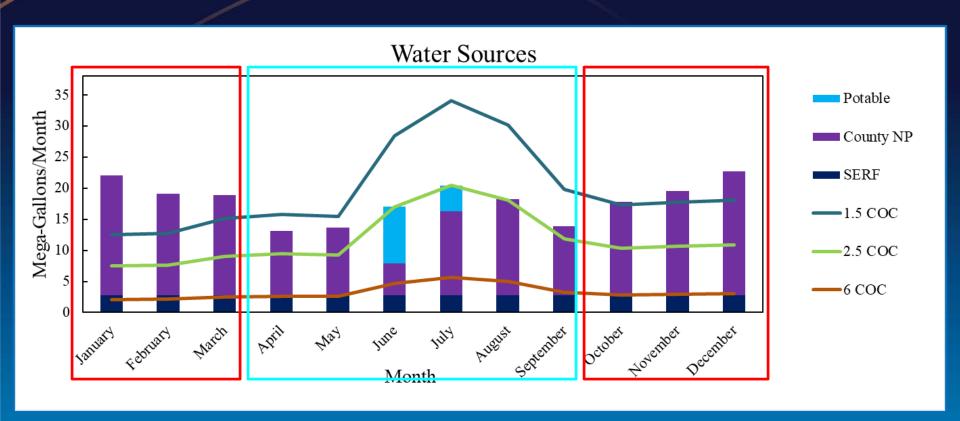
Water Treatment





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Water Treatment



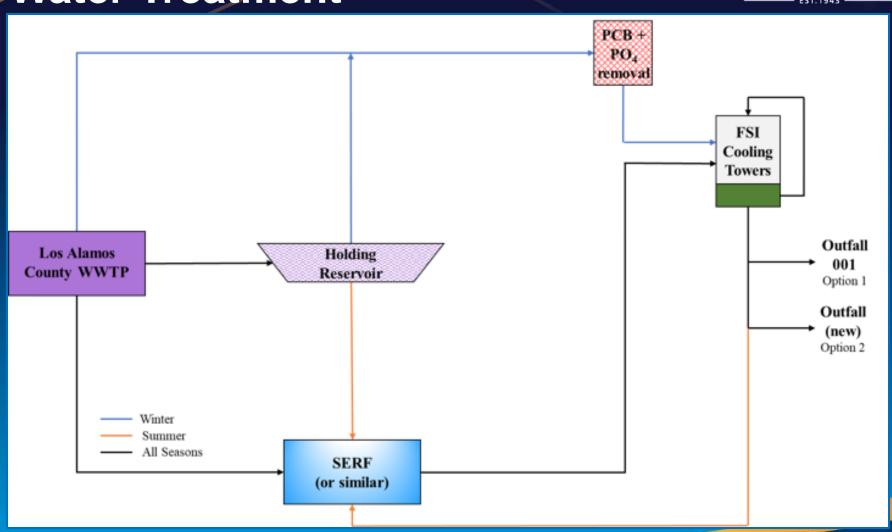






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Water Treatment







Water Treatment



- Récommendation for processing increased water volume:
 - Replicate SERF
 - Alternative pre-treatment
- Advantages of SERF style treatment:
 - Higher cycles of concentration
 - Less water use



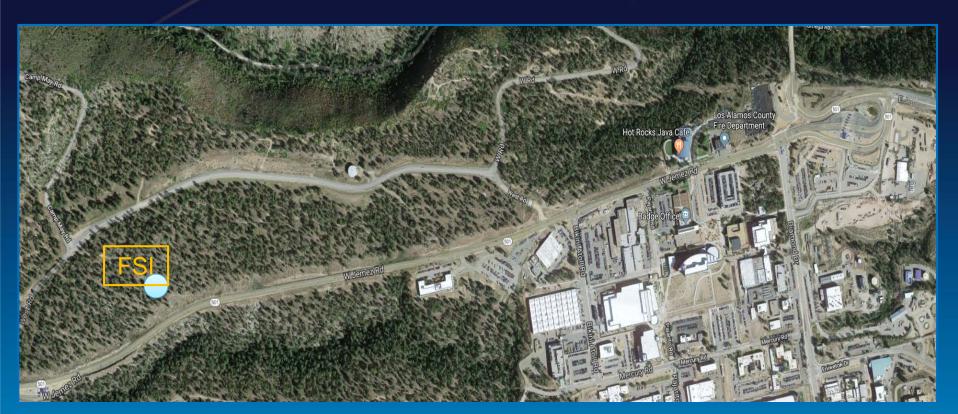


Outfall and Discharge





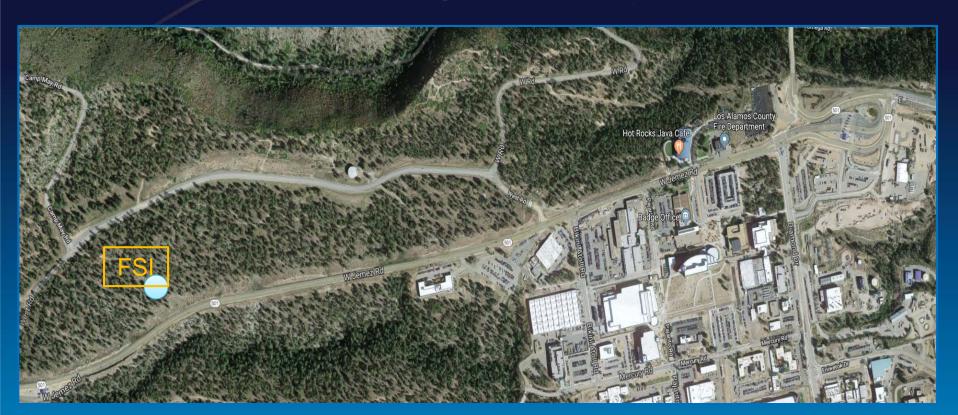
Outfall and Discharge







Outfall and Discharge







Contract Description





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Contract Description

- Need to reach consensus on:
 - Pricing for water
 - Location(s) of pipe tie-in(s)
 - Customer priority order
 - Ownership transfer
- Will need approval from:
 - LAC Utility Board
 - Possibly Los Alamos city council





Conclusion and Recommendations





Conclusion



- Sufficient volume of water
- Practical delivery
- able water quality
- Most feasible for ô. ? r
- Need infrastructure improvements for remaining months





Recommendations



For months of November through March treat water only for PCBs and PO₄

SERF Treatment

- \$64/kilo-gallon
- · Winter total: \$3.6M

PCB + PO₄ **Treatment**

- \$5/kilo-gallon
- · Winter total: \$0.5M
- Increase SERF reliability and capacity
- Create an outfall near FSI site





Future Work





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Future Work

- Continuous water testing of NP reuse water
 - At least once per month for 12+ months
 - For permitting and tower operations
- Cost estimation for service options
 - Piping routes
 - Treatment
 - Reservoir
- RO pilot study
- Evaporation ponds for SERF reject water



I saw many a bear!







Thank You!









Questions?

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